



505772

EPA-Markup of Landfill Gas Investigation Letter Work Plan

Karen Cibulskis

to:

Quigley, Steve, KBrown, jrc, Loney, Adam, Almeida, Luis, Paul Jack, roger.mccready

05/07/2008 12:52 PM

Cc:

mankowski.matthew, vanderpool.luanne, matt.justice, mark.allen, brett.fishwild, tccampbell,

nash.thomas, david.boehner

[Show Details](#)

Hi Steve.

Attached is EPA's markup of the Landfill Gas Investigation Letter Work Plan. Please revise the work plan to address EPA's revisions/comments and provide EPA with a revised version as soon as possible so we can get this approved/approved with modifications and you will have everything you need to finish up the FSP and QAPP (including FSP and QAPP SOPs).

I will start making any corrections to the first sections of the QAPP, which should be similar to the corrections I gave you for the FSP so far.

If you have any questions or would like to discuss EPA's comments further, please feel free to contact me via email or at 312-886-1843.

Thanks so much. I think we are getting close.

Karen.

Karen Cibulskis
Remedial Project Manager
United States Environmental Protection Agency
Region V
77 West Jackson Boulevard
Mail Code SR-6J
Chicago, IL 60604

Dear Karen:

Re: Landfill Gas/Soil Vapor Investigation Letter Work Plan
South Dayton Dump and Landfill Site, Moraine, Ohio (Site)

This Letter Work Plan presents the South Dayton Dump and Landfill Potentially Responsible Party Group's (PRP Group's) Work Plan for a landfill gas (LFG) and soil vapor investigation at the Site. A Site plan with proposed soil gas sampling probe locations is provided on Figure 1. This work will help address data gaps and provide necessary information to aid in the completion of a streamlined Feasibility Study (FS) for some portions of the Site. These data will also allow the PRP Group and the United States Environmental Protection Agency (USEPA) to determine which portions of the Site are appropriate for a streamlined FS.

The PRP Group has prepared this Letter Work Plan based on the discussions between the PRP Group and USEPA in February 2008.

The objectives of this Letter Work Plan are to:

1. assess the presence of ~~and generation potential for~~ LFG and soil vapor at locations within and adjacent to the Site;
2. obtain current data in locations where historic information indicated potential landfill gas generation concerns;
3. develop ~~sufficient~~ information to assist in ~~calculating~~ future landfill gas generation rates for the FS; and **THE LETTER WORK PLAN IS NOT CLEAR ON HOW FUTURE LANDFILL GAS GENERATIONS RATES WILL BE CALCULATED USING THE DATA COLLECTED IN THIS WORK PLAN. THE WORK IN THIS WORK PLAN IS NOT CONSISTENT WITH REQUIREMENTS FOR CALCULATING NON METHANE ORGANIC COMPOUNDS EMISSIONS RATES IN OHIO ADMINISTRATIVE CODE (OAC) 3745-76 OR WITH EXPLOSIVE MONITORING REQUIREMENTS IN OAC 3745-27-12. PERHAPS THIS OBJECTIVE SHOULD BE REMOVED?**
4. develop ~~sufficient~~ information to assist in ~~evaluating~~ the need for and type of landfill gas control at the Site for the FS.

LANDFILL GAS/SOIL VAPOR INVESTIGATION

Gas probes will be installed to evaluate LFG and soil vapor concentrations within ~~and adjacent~~

to the Site, including the properties along Dryden Road. Eighteen gas probes will be installed. Soil gas probe locations are presented on Figure 1. The procedures for installation of the probes are described below.

Five gas probes will be installed in the central portion of the Site to ~~establish~~ evaluate the presence of methane and non-methane volatile organic compounds (VOCs) ~~near the potential source of gas generation at these locations~~. Three probes will be installed in the vicinity of the former underground storage tank removals and the Valley Asphalt drum removal area to assess the landfill gas generation rates in those areas and soil vapor quality at these locations.

The remaining 10 probes are proposed to be installed on or adjacent to the Site boundary and in the vicinity of the commercial properties and structures along Dryden Road and west of East River Road to assess ~~the potential LFG generation and migration potential and soil vapor quality in these areas at these locations~~. ~~The boundary gas probe locations have been selected in order to characterize the potential for LFG and soil vapor migration from the Site boundary to off Site receptors.~~

GAS PROBE INSTALLATION

Soil gas probes will be installed using a 50-mm (2-inch) diameter Geoprobe dual-tube direct push technique to minimize formation disturbance. The borehole for the each gas probe will be advanced to a target depth in the unsaturated zone (a maximum of 20 feet below ground surface or 2 feet above the water table, whichever occurs first) corresponding to the bottom of the soil gas probe screened interval. **PLEASE EXPLAIN CRA'S RATIONALE FOR ADVANCING BOREHOLES TO A MAXIMUM DEPTH OF 20 FEET BGS. IN SOME AREAS THE THICKNESS OF THE LANDFILL ABOVE THE WATER TABLE MAY BE 30 TO 33 FEET.**

WHAT IS CRA'S RATIONALE FOR NOT CONSIDERING THE 2 FOOT INTERVAL ABOVE THE WATER TABLE AS A POTENTIAL LOCATION FOR A SCREENED INTERVAL? WOULDN'T THIS BE AN INTERVAL WHERE MAXIMUM CONCENTRATIONS OF ANY VOCS OFF-GASSING FROM GROUNDWATER MIGHT BE EXPECTED? THIS MIGHT BE IN A DIFFERENT ZONE THAN MAXIMUM CONCENTRATIONS OF METHANE OR OTHER NON METHANE ORGANIC COMPOUNDS FROM LANDFILL MATERIALS IN THE UNSATURATED ZONE.

PLEASE EXPLAIN HOW CRA WILL KNOW THE BOREHOLE HAS BEEN ADVANCED TO 2 FEET ABOVE THE WATER TABLE WITHOUT BORING INTO THE WATER TABLE FIRST AND THEN RETRACTING THE PROBE. The screened interval will be selected based on field observations that will identify the presence of landfill materials or, in the absence of such materials, a comparatively permeable region in the unsaturated zone that would be expected to transmit LFG and/or soil vapor. **PLEASE EXPLAIN HOW CRA WILL SELECT THE SCREENED INTERVAL IF LANDFILL MATERIALS ARE PRESENT. A ONE FOOT SCREEN IN A LOCATION WHERE THERE IS 10, 15 AND EVEN 20 OR 30 FEET OF LANDFILLED MATERIAL ABOVE THE WATER TABLE IN AN AREA WHERE GROUNDWATER MAY**

ALSO BE CONTAMINATED WITH VOCs MAY NOT PROVIDE ANY REAL MEANINGFUL INFORMATION ABOUT THE PRESENCE OR ABSENCE OF LANDFILL GAS/SOIL VAPOR THAT MIGHT NEED TO BE CONTROLLED AT THAT LOCATION. PID/FID HEADSPACE READINGS FROM THE PSARA BORINGS ALSO SHOW THAT SOME SAMPLING INTERVALS HAD SIGNIFICANTLY HIGHER LEVELS OF METHANE AND NONMETHANE COMPOUNDS THAN OTHER INTERVALS. IF CRA COULD COLLECT PID AND FID HEADSPACE READINGS FROM EVERY 2 FOOT INTERVAL DOWN TO THE WATER TABLE, AND SET SCREENS IN INTERVALS WITH MAXIMUM METHANE AND MAXIMUM NONMETHANE CONCENTRATIONS, THIS MIGHT BETTER SUPPORT THE PRESENCE OR ABSENCE OF LANDFILL GAS/SOIL VAPOR THAT MIGHT NEED TO BE CONTROLLED AT THAT LOCATION. EPA RECOGNIZES HOWEVER, THAT THIS WORK IS NOT NEEDED TO SUPPORT EPA'S PRESUMPTIVE REMEDY FOR THE SITE.

PLEASE INDICATE THAT A GEOLOGIST WILL BE ON-SITE TO LOG CONTINUOUS CORES AND TO DETERMINE WHAT CONSTITUTES A "COMPARATIVELY PERMEABLE REGION".

PLEASE INCLUDE WHICH METHODS THE GEOLOGIST WILL USE FOR THE FIELD CLASSIFICATION.

SINCE THE SCREENED INTERVAL IS NARROW, 1 FOOT IN LENGTH, AND THERE MAY BE MORE THAN ONE PERMEABLE REGION WITHIN EACH BORING SEPARATED BY AN IMPERMEABLE REGION IN AREAS WHERE LANDFILLED MATERIALS ARE NOT PRESENT, THERE SHOULD BE CONSIDERATIONS FOR NESTING GAS PROBES AT EACH LOCATION TO COVER ALL PERMEABLE REGIONS. OTHERWISE, PROVIDE DETAILS ON HOW THE SITE GEOLOGIST WILL DETERMINE AT WHICH PERMEABLE ZONE THE SCREENED INTERVAL WILL BE PLACED.

PLEASE INDICATE IF PHOTOGRAPHIC EVIDENCE WILL BE COLLECTED TO DOCUMENT CORES. THIS WOULD BE HELPFUL.

The soil gas probes will be completed using 13-mm (0.5-inch) diameter schedule 40 PVC continuous piping (i.e., no joints) with a screened interval length of 0.3 meters. The void space between the screened interval and formation will be filled with No. 3 silica sand (i.e., sand pack) to approximately 0.2 meters above the top of the screened interval. Hydrated bentonite will be placed on top of the sand pack to just below ground surface. The sand pack and bentonite seal will be placed as the Geoprobe was withdrawn to ensure that the formation does not collapse around the screened interval or riser. A lockable surface casing will be set in concrete at ground surface around each soil gas probe. The soil gas probe completion details are summarized in the Field Sampling Plan (FSP), CRA March 2008, to be re-submitted). The soil gas probe stratigraphic and instrumentation logs are presented in the FSP.

PLEASE EXPLAIN THE PROCEDURES THAT WILL BE USED TO PREVENT BRIDGING OF THE SAND AS THE SAND PACK IS PLACED OR INDICATE THAT THESE PROCEDURES WILL BE IN THE FSP.

ONE FOOT DEPTH OF DRY GRANULAR BENTONITE SHOULD BE PLACED ON TOP OF THE SAND PACK BEFORE HYDRATED BENTONITE IS USED TO PREVENT THE

HYDRATED BENTONITE FROM ENTERING AND CLOGGING THE SAND PACK.

Soil samples will be collected from the surface and subsurface during the soil gas probe installation for the analyses of soil physical properties (i.e., grain size analyses, fraction or organic carbon content, plasticity index, porosity, permeability, and Atterburg limits).

INDICATE THAT THE FSP WILL INCLUDE MORE DETAILS ON THE PROCEDURES FOR COLLECTING PHYSICAL PROPERTY SOIL SAMPLES; SUCH AS HOW MANY WILL BE COLLECTED, HOW THEY WILL BE COLLECTED, WHAT CRITERIA WILL BE USED FOR COLLECTION, WILL SOIL SAMPLES BE COLLECTED ALONG THE LENGTH OF THE BORING OR JUST IN THE AREA OF THE SCREEN, ETC.

LANDFILL GAS/SOIL VAPOR MONITORING

CRA will complete two rounds of monitoring. The monitoring consists of:

- i) measurement of gas pressure;
- ii) screen for methane (v/v) and lower explosive limit (LEL) and oxygen (v/v); and
- iii) collection of Summa canister samples for the VOC analyses.

The initial soil gas sampling will be conducted 1 week following soil gas probe installation. Following soil gas probe installation, one week is considered to provide more than sufficient time for any formation disturbances created by drilling activities to dissipate and for equilibrium conditions to be reestablished in the unsaturated zone. As a result, the soil gas samples are considered representative of steady-state conditions in the unsaturated zone at the time the samples are collected. **WITH SOIL GAS, STEADY-STATE CONDITIONS ARE NON-EXISTENT.** The three monitoring elements are described below.

IF CRA IS REALLY MONITORING THE LANDFILL GAS (I.E., PRESSURE, METHANE, LEL AND OXYGEN), THIS SHOULD (AND COULD BE EASILY) DONE AT THE SAME FREQUENCY AS THE SYNOPTIC GROUNDWATER MEASUREMENTS. OTHERWISE CHANGE "MONITORING" TO "SAMPLING".

i) Measurement of Gas Pressure

A pressure gauge will be attached to the hose barb on the LFG probe to measure the static gas pressure. The pressure gauge will be sufficiently sensitive to record gas pressure to 0.1 pounds per square inch (psig).

PLEASE INDICATE THAT BAROMETRIC PRESSURE WILL BE RECORDED WHENEVER READINGS ARE TAKEN FROM THE SOIL GAS PROBES AND THAT IT WILL BE NOTED WHETHER THE BAROMETER IS RISING OR FALLING.

Two rounds of gas pressure measurements will be collected separated by at least one month.

ii) Screen for Methane, LEL, and Oxygen

A Multimeter will be used to draw a sample from each probe to measure and record the methane, LEL, and oxygen readings.

INCLUDE CARBON DIOXIDE AS A PARAMETER, SOIL GAS TEMPERATURE, READINGS OF AMBIENT AIR TEMPERATURE AND BAROMETRIC PRESSURE.

Two rounds of this monitoring will be completed separated by at least one month.

INDICATE THE MULTIMETER TO BE USED FOR SOIL GAS PROBE MONITORING WILL BE DESCRIBED IN THE FSP, AND THAT THE FSP WILL INCLUDE STARTUP, CALIBRATION, AND MAINTENANCE PROCEDURES NECESSARY FOR PERFORMING FIELDWORK. INDICATE THAT THE FSP WILL INCLUDE INFORMATION ON LOGGING FIELD CALIBRATION PROCEDURES AND PROVIDING DOCUMENTATION ON FACTORY PERFORMED CALIBRATION. INDICATE THAT THE FSP WILL INCLUDE PROVISIONS FOR MAKING SURE THE PAPERWORK IS AVAILABLE FOR REVIEW DURING FIELD WORK.

INDICATE THAT THE FSP WILL PROVIDE MORE INFORMATION ON THE DATA THAT WILL BE OBTAINED FROM THE MULTIMETER; FOR EXAMPLE, METHANE AS PERCENT BY VOLUME, LEL IN PERCENT, OYGEN IN PERCENT AND PERCENT CARBON DIOXIDE. THE FSP SHOULD ALSO STATE THE ORDER IN WHICH READINGS WILL BE COLLECTED AND INDICATE THAT THE HIGHEST VALUE OBTAINED DURING A READING WILL BE RECORDED.

INDICATE THAT THE WELL PURGING PROCEDURES TO BE USED PRIOR TO MONITORING WITH THE MULTIMETER WILL BE INCLUDED IN THE FSP.

iii) Summa Canisters

One round of soil gas samples will be collected during the first round of methane measurements using 6-liter capacity Summa™ canisters fitted with a laboratory calibrated critical orifice flow regulation device sized to allow the collection of the soil gas sample over a 1-hour sample collection time. The 1-hour sample collection time for a 6-liter capacity Summa™ canister corresponds to a maximum soil gas sample collection flow rate of approximately 200 milliliters per minute (mL/min). This soil gas sample collection flow rate corresponds to the maximum flow rate recommended in the soil gas sampling protocol recently developed by the California Environmental Protection Agency (CAEPA) (CAEPA, 2003). A maximum flow rate of 200 mL/min is recommended to limit VOC stripping from soil, and prevent the short-circuiting of ambient air from ground surface that would dilute the soil gas sample, and increase confidence regarding the location from which the soil gas sample is obtained. **LOW FLOW PURGING AND SAMPLE COLLECTION WILL NOT HAVE AN EFFECT ON CONFIDENCE IN THE SELECTED PROBE OR SCREEN LOCATIONS.** The low flow rate of 200 mL/min ~~provides the most~~ will increase the likelihood that a representative sample of in situ conditions is obtained. Prior to sample collection, soil gas probe purging will be conducted at a maximum flow rate of 200 mL/min. Two soil gas probe volumes (calculated based on casing and sand pack volume) will be purged to remove potentially stagnant air from

the internal volume of the soil gas probe and ensure that soil gas representative of the formation is drawn into the soil gas probe.

THE CALIFORNIA SOIL GAS PROTOCOL ALSO SPECIFIES A PURGE TEST TO DETERMINE THE CORRECT VOLUME OF AIR TO BE PURGED TO REMOVE ALL STAGNANT OR AMBIENT AIR. WITHOUT CONDUCTING THE PURGE TEST IT IS NOT KNOWN IF THE SAMPLE COLLECTED IS THE MOST REPRESENTATIVE. PLEASE REVISE THE WORK PLAN TO INDICATE THAT A PURGE TEST WILL BE CONDUCTED AT EACH LOCATION AND THAT THE DETAILS OF THE PURGE TEST WILL BE PROVIDED IN THE FSP. AS INDICATED IN THE PROTOCOL, ONE TO SEVEN PURGE VOLUMES MAY BE REQUIRED BASED ON THE OBTAINED DATA. THE PURGE FLOW RATE SHOULD BE EQUAL TO THE SAMPLE COLLECTION FLOW RATE.

The Summa canister samples will be analyzed for VOCs using USEPA method TO-15.

Quality control/quality assurance (QA/QC) measures to be implemented during the soil gas sampling event include maintaining a minimum negative pressure in the Summa™ canisters following sample collection, collection of one field duplicate sample, collection of an ambient air sample, and the analysis of a trip blank Summa™ canister. Further details regarding the soil gas probe sampling protocol and the applied QC/QA measures are presented in the Field Sampling Plan.

ENSURE THE DETAILS OF HOW THE FIELD DUPLICATE SAMPLE WILL BE SET UP AND COLLECTED WILL BE IN THE FSP.

IT IS NOT CLEAR WHERE THE AMBIENT AIR SAMPLE WILL BE COLLECTED AND HOW THE SAMPLE WILL BE COLLECTED RELATIVE TO THE ON-SITE SAMPLING LOCATIONS, OTHER SITE AREAS, WIND DIRECTION AND VELOCITY. IT IS ALSO NOT CLEAR HOW THIS DATA WILL BE USED. PLEASE EXPLAIN.

DESCRIBE HOW THE SUMMA CANISTER TRIP BLANK DATA WILL BE USED. THIS DOESN'T SEEM TO BE NECESSARY IF THE CANISTERS HAVE BEEN LABORATORY CERTIFIED AND HAVE MAINTAINED VACUUM FROM LABORATORY TO SHIPPING. IN ADDITION, POSITIVE TRIP BLANK HITS MAY ONLY INDICATE THAT A PARTICULAR CANISTER HAS LEAKED.

PROVIDE A TABLE LISTING THE ANALYTES THAT ARE INCLUDED IN THE TO15 ANALYSIS AND ENSURE THAT ALL COMPOUNDS THAT HAVE BEEN DETECTED AT THE SITE THAT COULD POSE A RISK THROUGH VAPOR INTRUSION ARE INCLUDED (E.G., SEE RISK TABLE IN EPA'S VAPOR INTRUSION GUIDANCE). FOR EXAMPLE, NAPHTHALENE HAS BEEN DETECTED IN SITE SOILS, BUT MUST BE REQUESTED FOR A TO15 ANALYSIS.

SCHEDULE

The LFG and soil gas investigation will begin within four weeks of USEPA approval of this Letter Work Plan, or the relevant sections of the Field Sampling Plan and Quality Assurance Project Plan, or USEPA's review of the Health and Safety Plan, whichever occurs later, and will

be completed over a two week period. The second LFG monitoring event (gas pressure, methane, LEL, and oxygen) will occur with 6 weeks of the first monitoring event. The PRP Group will provide the USEPA with ~~written~~ verbal notification ~~one week~~ at least 15 days in advance of the initiation of this activity.

IF THERE ARE ONLY TWO LFG SAMPLING EVENTS, CHANGE "MONITORING" TO "SAMPLING".

WHILE THE EXACT SCHEDULE IS SUBJECT TO CHANGE BASED ON EPA REVIEW AND APPROVAL OF THE REVISED LANDFILL GAS LETTER WORK PLAN, FSP AND QAPP, IS CRA PLANNING ON CONDUCTING MORE THAN ONE SAMPLING ACTIVITY AT THE SAME TIME, OR CONDUCTING EACH INVESTIGATION SEQUENTIALLY? IF MORE THAN ONE ACTIVITY IS PLANNED AT THE SAME TIME PLEASE LET EPA KNOW SO WE CAN PLAN FOR APPROPRIATE FIELD OVERSIGHT. THANKS.

All work will be performed in accordance with the Field Sampling Plan, Quality Assurance Project Plan, and Site-Specific Health and Safety Plan, pending USEPA's approval of the relevant sections of these documents.

REPORTING

The results of the LFG and soil gas investigation and analytical results will be summarized and presented in a technical memorandum. The memorandum, which will include a description of the fieldwork completed, any deviations from the proposed work, and the rationale behind the change, and photographs. Figures detailing the actual installations, analytical summary tables, and analytical data reports will also be included in the technical memorandum. The technical memorandum will be provided to the USEPA within one month of the completion of the proposed work. The data will be used in the FS and to assist in identifying potential areas where further investigation or assessment may be appropriate.

THE TECHNICAL MEMORANDUM SHOULD ALSO CONTAIN SOIL GAS ISO-CONCENTRATION MAPS AND SOIL/WASTE LOGS FOR ALL BORINGS. DATA FROM THE LANDFILL GAS INVESTIGATION SHOULD BE COMBINED WITH PID AND FID MEASUREMENTS FROM OTHER SITE INVESTIGATIONS TO CREATE A BROADER UNDERSTANDING OF LANDFILL GAS/SOIL VAPOR, AND THEN ALSO COMBINE THIS INFORMATION WITH GROUNDWATER RESULTS TO SEE HOW LANDFILL GAS/SOIL VAPOR AND GROUNDWATER CONCENTRATIONS COMPARE - TO THE EXTENT THIS CAN BE EVALUATED SINCE NOT ALL SAMPLING WAS DONE AT THE SAME LOCATIONS.

Should you have any questions on the above, please do not hesitate to contact us.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

EPA-Approved Landfill Gas Investigation Letter Work Plan

Karen Cibulskis

to:

Quigley, Steve, KBrown, jrc, Loney, Adam, Almeida, Luis, Paul Jack, roger.mccready

05/28/2008 12:49 PM

Cc:

mankowski.matthew, vanderpool.luanne, matt.justice, mark.allen, brett.fishwild, tccampbell,
nash.thomas, david.boehnker

Show Details

Hi Steve.

Attached is the EPA-approved Landfill Gas Investigation Letter Work Plan. The landfill gas work plan has been modified to make some language changes to the document that do not affect the scope of the work. EPA's basis for each modification is summarized in the work plan after each change.

If CRA agrees with these changes, please make the attached redline/strikeout corrections in the work plan, remove EPA's explanations, and resubmit the work plan as a .pdf for EPA's records. It would also help if you could change the letter heading to "Final Landfill Gas Letter Work Plan" or something similar to avoid any confusion.

Thanks again for all your work on this. If you have any questions please feel free to contact me via email or at 312-886-1843. Today is my last day in the office until June 16th but I will try to check my email before I leave Chicago Saturday, and we are still working on reviewing the geophysical sections of the FSP so we can either approve it or get something back to you before I go.

Karen.

Karen Cibulskis
Remedial Project Manager
United States Environmental Protection Agency
Region V
77 West Jackson Boulevard
Mail Code SR-6J
Chicago, IL 60604

Dear Karen:

Re: Landfill Gas/Soil Vapor Investigation Letter Work Plan
South Dayton Dump and Landfill Site, Moraine, Ohio (Site)

This Letter Work Plan presents the South Dayton Dump and Landfill Potentially Responsible Party Group's (PRP Group's) Work Plan for a landfill gas (LFG) and soil vapor investigation at the Site. A Site plan with proposed soil gas sampling probe locations is provided on Figure 1. This work will help address data gaps and provide information to aid in the completion of a Feasibility Study (FS). All work will be performed in accordance with the United States Environmental Protection Agency (USEPA) -approved Field Sampling Plan (FSP), Quality Assurance Project Plan (QAPP), and Site-Specific Health and Safety Plan (HASP).

The PRP Group has prepared this Letter Work Plan based on the discussions between the PRP Group and USEPA in February 2008. The Letter Work Plan incorporates comments received from USEPA on May 7, 2008.

The objectives of this Letter Work Plan are to:

1. assess the presence of LFG and soil vapor at locations within the Site (pressure, methane, LEL, carbon dioxide and oxygen; and other chemicals at the detection limits listed in Table 1); **THE DETECTION LIMITS SELECTED BY CRA ARE VERY HIGH, AND ARE SIGNIFICANTLY HIGHER THAN THE PRGs FOR AIR IN THE QAPP, AND GENERIC SOIL GAS CRITERIA IN EPA'S VAPOR INTRUSION GUIDANCE. THIS WILL LIMIT THE USEFULNESS OF THE DATA FOR CHEMICALS THAT ARE NON-DETECT. ALSO, CRA HAS CHOSEN NOT TO INCLUDE NAPHTHALENE IN THE ANALYSIS, WHICH HAS BEEN DETECTED IN SITE SOILS AT CONCENTRATIONS AS HIGH AS 1,100 UG/KG. EPA IS NOT REQUIRING ANY CHANGES HOWEVER, SINCE THIS WORK IS NOT NEEDED TO SUPPORT EPA'S PRESUMPTIVE REMEDY FOR THE SITE.**
2. obtain current data in locations where historic information indicated potential landfill gas generation concerns;

3. develop information to assist in calculating future landfill gas generation rates for the FS¹; and **THE WORK PROPOSED IN THIS LETTER WORK PLAN ASSUMES THE LIMITS OF THE LANDFILL ARE CONSISTENT WITH THE PRP'S DIRECT CONTACT PRESUMPTIVE REMEDY AREA (DC-PRA), AND DOES NOT CONSIDER LANDFILL GAS/VOC IMPACTS TO ON-SITE BUILDINGS FROM LANDFILL SOURCES OUTSIDE THE PRPs' DC-PRA**, AS DOCUMENTED BY UST REMOVAL REPORTS, THE VALLEY ASPHALT DRUM REMOVAL, THE MAP FROM THE HEALTH DEPARTMENT, AIR PHOTOS, THE VALLEY ASPHALT WELL LOG AND SOIL BORING LOGS; OR FROM VOC-CONTAMINATED GROUNDWATER. **THE WORK PROPOSED IN THIS WORK PLAN WILL NOT CONFIRM THAT OCCUPANTS OF ON-SITE STRUCTURES ARE NOT AT RISK FROM EXPLOSIVE GAS OR NON-METHANE VOCs. IF CRA REALLY WANTED TO CONFIRM OCCUPANTS OF ON-SITE STRUCTURES ARE NOT AT RISK FROM LANDFILL GAS AND NON-METHANE VOCs, THE BEST WAY TO DO THIS WOULD BE TO IMPLEMENT AN APPROPRIATE LANDFILL GAS/VOC SAMPLING PLAN ADJACENT TO/UNDERNEATH EACH ON-SITE STRUCTURE WITH APPROPRIATE ANALYTES AND DETECTION LIMITS. HOWEVER, EPA IS NOT REQUIRING THIS WORK SINCE THIS WORK IS NOT NEEDED TO SUPPORT EPA'S PRESUMPTIVE REMEDY FOR THE SITE. ALSO, ALTHOUGH THIS LANDFILL IS NO LONGER OPERATING IT IS NOT A "CLOSED" LANDFILL. ADDITIONAL INFORMATION IS NEEDED TO EXPLAIN WHY CRA DOES NOT CONSIDER OAC 3745-76 AN ARAR..**
4. develop information to assist in evaluating the need for and type of landfill gas control at the Site for the FS.

LANDFILL GAS/SOIL VAPOR INVESTIGATION

Gas probes will be installed to evaluate LFG and soil vapor concentrations within the Site, including the properties along Dryden Road. Eighteen gas probes will be installed. Soil gas probe locations are presented on Figure 1. The procedures for installation of the probes are described below.

Five gas probes will be installed in the central portion of the Site to evaluate the presence of methane and non-methane volatile organic compounds (VOCs) in the sampled interval at these locations. Three probes will be installed in the vicinity of the former underground storage tank removals and the Valley Asphalt

¹~~The requirements for the explosive gas monitoring plan specified in OAC 3745-27-12 will be assessed once it is known if there is explosive gas issues associated with this landfill that has been closed for more than 30 years.~~

drum removal area to assess landfill gas and soil vapor quality in the sampled interval at these locations. **THERE MAY BE MORE THAN ONE INTERVAL THAT SHOULD BE SAMPLED. IN SOME AREAS THE EXTENT OF LANDFILL CONTENTS ABOVE THE WATER TABLE MAY BE MORE THAN 30 FEET. IF THE "MOST PERMEABLE ZONE" IS BELOW OR NEAR THE BOTTOM OF THE LANDFILL IT MAY NOT CHARACTERIZE LANDFILL GAS/VOCS FROM LANDFILL SOURCES IN EQUAL OR STILL PERMEABLE ZONES THAT MAY BE IMPACTED BY DIFFERENT SOURCE MATERIALS AND ARE CLOSER TO RECEPTORS. HOWEVER, THIS WORK IS NOT REQUIRED TO SUPPORT EPA'S PRESUMPTIVE REMEDY FOR THE SITE.**

The remaining 10 probes are proposed to be installed on or adjacent to the Site boundary and in the vicinity of the commercial properties and structures along Dryden Road and west of East River Road to assess LFG and soil vapor quality in the sampled interval at these locations.

GAS PROBE INSTALLATION

Soil gas probes will be installed using a 50-mm (2-inch) diameter Geoprobe dual-tube direct push technique to minimize formation disturbance. The borehole for each gas probe will be advanced to a target depth in the unsaturated zone (a maximum of 20 feet below ground surface or 2 feet above the water table, whichever occurs first).

Soil and fill materials encountered will be logged. The soil log information recorded will include a visual description of the types of material (i.e., undisturbed native soil, spoils from quarry operations, domestic refuse, industrial refuse, metallic debris, ash, fly ash, construction and demolition debris, foundry sand, asphalt, slag, or other appropriate description) and, if possible, a Unified Soil Classification System (USCS) description. Native soils will be logged using the USCS by CRA's staff. A photograph of each core sample collected will be taken and a photographic log will be documented in the field notes. Should groundwater be encountered in any borehole, the tube will be pulled up a minimum of 2 feet above the water table. The void that is formed when the tube is pulled will be filled using No. 3 silica sand. The groundwater elevation of the nearest monitoring well will be used to determine the targeted depth of the borehole for the soil gas probes.

The screened interval of the gas probes will be installed in soil strata with a notably higher permeability than the surrounding geologic strata. ~~Strata with a higher permeability have a greater potential for gas migration and therefore will be monitored.~~ The final depth of the gas probe screen will be dependent on the conditions observed at each location and will be determined in the field. **CRA IS ONLY INSTALLING ONE GAS PROBE AT EACH SAMPLING LOCATION.. THIS WILL NOT CHARACTERIZE ALL PERMEABLE INTERVALS AT A LOCATION, AND MAY NOT CHARACTERIZE ANY DEPTH-RELATED**

DIFFERENCES IN LANDFILL SOURCE MATERIALS AT THAT LOCATION. THERE ARE ALSO OTHER REASONS FOR SAMPLING AT ADDITIONAL INTERVALS, SUCH AS SAMPLING AT INTERVALS CONSISTENT WITH SLAB AND BASEMENT FOUNDATIONS. HOWEVER, THIS WORK IS NOT REQUIRED TO SUPPORT EPA'S PRESUMPTIVE REMEDY FOR THE SITE.

The borehole for each gas probe will be advanced to a maximum depth of 20 feet below ground surface or 2 feet above the water table, whichever occurs first, to determine the appropriated depth in which the soil gas probe will be installed in the unsaturated zone. The screened interval of the gas probes will be installed in strata with a notably higher permeability than the surrounding geologic strata. ~~Strata with a higher permeability have a greater potential for gas migration and therefore will be monitored.~~ The final depth of the gas probe screen will be dependent on the conditions observed at each location and will be determined in the field.

The average depth of the unsaturated zone across the Site is approximately 20 feet bgs; therefore a target depth of 20 feet is based on the need to place the gas probes in the unsaturated zone near the surface where landfill gas if present will diffuse and migrate

The purpose of this investigation is to assess the migration potential and generation rate(s) of methane and non-methane VOC's in the soil gas. If soil gas probes are installed in the 2-foot interval above the water table, the gas probes will periodically be saturated and will not generate meaningful data. ~~The proposed probe locations will address soil vapor concentrations near potential receptors.~~ **SEE PREVIOUS COMMENTS. THE WORK PROPOSED IN THIS LETTER WORK PLAN ASSUMES THE LIMITS OF THE LANDFILL ARE CONSISTENT WITH THE PRP'S DIRECT CONTACT PRESUMPTIVE REMEDY AREA (DC-PRA), AND THAT GROUNDWATER BENEATH ON-SITE STRUCTURES IS NOT A SOURCE OF VOCs. IF CRA REALLY WANTED TO CONFIRM OCCUPANTS OF ON-SITE STRUCTURES WERE NOT AT RISK FROM LANDFILL GAS OR NON-METHANE VOCs, THE BEST WAY TO DO THIS WOULD BE TO IMPLEMENT AN APPROPRIATE LANDFILL GAS/VOC SAMPLING PLAN ADJACENT TO/UNDERNEATH EACH ON-SITE STRUCTURE WITH APPROPRIATE ANALYTES AND DETECTION LIMITS.**

The screened interval will be selected based on field observations that will identify the presence of landfill materials or, in the absence of such materials, a comparatively permeable region in the unsaturated zone that would be expected to transmit LFG and/or soil vapor. The screened interval selection details are summarized in the Field Sampling Plan. **PLEASE ADD THESE DETAILS TO THE FSP. IT IS NOT CLEAR HOW THE MOST PERMEABLE INTERVAL WILL BE SELECTED/WHERE THE SCREEN WILL BE PLACED IN AREAS WHERE LANDFILLED MATERIALS ARE PRESENT.**

The soil gas probes will be completed using 13-mm (0.5-inch) diameter schedule

40 PVC continuous piping (i.e., no joints) with a screened interval length of 0.3 meters. The void space between the screened interval and formation will be filled with No. 3 silica sand (i.e., sand pack) to approximately 0.2 meters above the top of the screened interval. One foot of dry granular bentonite will be placed on top of the sand pack and then hydrated bentonite will be placed to just below ground surface. The sand pack and bentonite seal will be placed as the Geoprobe is withdrawn to ensure that the formation does not collapse around the screened interval or riser. A lockable surface casing will be set in concrete at ground surface around each soil gas probe. The soil gas probe completion details are summarized in the Field Sampling Plan (FSP), CRA March 2008, to be re-submitted). The soil gas probe stratigraphic and instrumentation logs are presented in the FSP.

Soil samples will be collected from the surface and subsurface during the soil gas probe installation for the analyses of soil physical properties (i.e., grain size analyses, fraction or organic carbon content, plasticity index, porosity, permeability, and Atterburg limits). The procedures for collecting soil samples are presented in the FSP.

LANDFILL GAS/SOIL VAPOR SAMPLING

CRA will complete two rounds of sampling. The sampling consists of:

- i) measurement of gas pressure;
- ii) screen for methane (v/v) and lower explosive limit (LEL) and oxygen (v/v); and
- iii) collection of Summa canister samples for the VOC analyses.

The initial soil gas sampling will be conducted 1 week following the installation of soil gas probes. One week is considered to be more than sufficient time for any formation disturbances created by drilling activities to dissipate and for equilibrium conditions to be reestablished in the unsaturated zone. As a result, the soil gas samples are considered representative of conditions in the unsaturated zone sampled intervals at the time the samples are collected. The three ~~monitoring~~ sampling elements are described below.

i) Measurement of Gas Pressure

A pressure gauge will be attached to the hose barb on the LFG probe to measure the static gas pressure. The pressure gauge will be sufficiently sensitive to record gas pressure to 0.1 pounds per square inch (psig). The highest value obtained during gas pressure readings will be recorded. The ambient barometric pressure will be recorded at each gas probe when soil gas pressure readings are being taken. The ambient barometric trends will also be noted (i.e. rising, falling, steady).

Two rounds of gas pressure measurements will be collected separated by at least one month.

ii) Screen for Methane, LEL, Carbon Dioxide, and Oxygen

A Multimeter will be used to draw a sample from each probe to measure and record the methane, LEL, carbon dioxide and oxygen readings. The highest values obtained during sampling will be recorded. The ambient and soil gas temperatures will be recorded at each gas probe when soil gas readings are being taken. The ambient barometric trends also will be noted (i.e. rising, falling, steady).

Two rounds of this sampling will be completed separated by at least one month. The details regarding the calibration and maintenance frequency and procedures, instrument start up procedures, and recording of data for instruments used during the installation and sampling of the soil gas probes will be provided in the FSP. These instruments include PIDs, multimeters, barometers, and thermometers. The FSP will specify gas probe purging rates and procedures. A copy of the supplier instrument calibration will be available for review in the field. All field calibration procedures and readings will be documented in the field logbook.

iii) Summa Canisters

One round of soil gas samples will be collected during the first round of methane measurements using 6-liter capacity Summa™ canisters fitted with a laboratory calibrated critical orifice flow regulation device sized to allow the collection of the soil gas sample over a 1-hour sample collection time. The 1-hour sample collection time for a 6-liter capacity Summa™ canister corresponds to a maximum soil gas sample collection flow rate of approximately 200 milliliters per minute (mL/min). This soil gas sample collection flow rate corresponds to the maximum flow rate recommended in the soil gas sampling protocol recently developed by the California Environmental Protection Agency (CAEPA) (CAEPA, 2003). A maximum flow rate of 200 mL/min is recommended to limit VOC stripping from soil, and prevent the short-circuiting of ambient air from ground surface that would dilute the soil gas sample. The low flow rate of 200 mL/min will increase the likelihood that a representative sample of in situ conditions is obtained. Prior to sample collection, soil gas probe purging will be conducted at a maximum flow rate of 200 mL/min. Two soil gas probe volumes (calculated based on casing and sand pack volume) will be purged to remove potentially stagnant air from the internal volume of the soil gas probe ~~and ensure that soil gas representative of the formation is drawn into the soil gas probe.~~ *CRA IS NOT CONDUCTING STEP RATE TESTS TO ENSURE SOIL GAS REPRESENTATIVE OF THE FORMATION IS DRAWN INTO THE SOIL GAS PROBE.* The FSP provides the soil gas purging and sampling procedures

including the calculation of purge volume, maximum purge volume and maximum purging rates. Once the flow rate is set for a cannister, the time it will take to fill up the cannister will be calculated and the sampler will retrieve the cannister and turn off the flow at the calculated time to prevent the valve from being open after the cannister is filled.

The Summa[™] canister samples will be analyzed for VOCs using USEPA method TO-15. The VOCs included in USEPA method TO-15 and the method detection limits the PRP group has selected for this sampling are listed in Table 1. **SEE PREVIOUS COMMENTS. THESE DETECTION LIMITS ARE VERY HIGH, AND ARE SIGNIFICANTLY HIGHER THAN THE PRGS FOR AIR IN THE QAPP, AND FOR GENERIC SOIL GAS CRITERIA IN EPA'S VAPOR INTRUSION GUIDANCE. HOWEVER, THIS WORK IS NOT REQUIRED TO SUPPORT EPA'S PRESUMPTIVE REMEDY FOR THE SITE.**

Quality control/quality assurance (QA/QC) measures to be implemented during the soil gas sampling event include maintaining a minimum negative pressure in the Summa[™] canisters following sample collection, collection of one field duplicate sample, collection of an ambient air sample, and the analysis of a trip blank Summa[™] canister. Further details regarding the soil gas probe sampling protocol and the applied QC/QA measures are presented in the Field Sampling Plan FSP.

SCHEDULE

The LFG and soil gas investigation will begin within four weeks of USEPA approval of this Letter Work Plan, or the relevant sections of the Field Sampling Plan and Quality Assurance Project Plan, or USEPA's review of the Health and Safety Plan, whichever occurs later, and will be completed over a two week period. The second LFG sampling event (gas pressure, methane, LEL, and oxygen) will occur with 6 weeks of the first sampling event. The PRP Group will provide the USEPA with verbal notification at least 15 days in advance of the initiation of this activity.

All work will be performed in accordance with the Field Sampling Plan, Quality Assurance Project Plan, and Site-Specific Health and Safety Plan, pending USEPA's approval of the relevant sections of these documents.

REPORTING

The results of the LFG and soil gas investigation and analytical results will be summarized and presented in a technical memorandum. The memorandum will include a description of the fieldwork completed, any deviations from the

proposed work, and the rationale behind the change, and photographs taken during the investigation. Figures detailing the actual installations, analytical summary tables, iso-concentration maps, and analytical data reports will also be included in the technical memorandum. The technical memorandum will be provided to the USEPA within one month of the completion of the proposed work. The data will be used in the FS and to assist in identifying potential areas where further investigation or assessment may be appropriate.

Should you have any questions on the above, please do not hesitate to contact us.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

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EPA-Approved Landfill Gas Letter Work Plan Revision 2

Karen Cibulskis to: Quigley, Steve, Almeida, Luis, Loney, Adam, cbay3, jrc,
KBrown, roger.mccready

07/01/2008 05:59 PM

Cc: vanderpool.luanne, mankowski.matthew, matt.justice, mark.allen, brett.fishwild,
tccampbell, nash.thomas, david.boehnker

Hi Steve. EPA has approved the attached Landfill Gas Letter Work Plan Revision 2 with the modifications shown in underline/strikeout. Some of the modifications EPA made include:

1. Change the Summa Cannister sampling rate to 100 mL/minute consistent with CRA's FSP SOP.
2. Clarify that landfill gas sampling will not be conducted during and no less than 48 hours after a significant rain event (consistent with CRA's FSP SOP) or on-site watering (consistent with CAL 2003).
3. Clarify that in areas where landfill materials extend to within 3 feet of the surface, the top of the screened interval will be set 3 to 5 feet below ground surface.
4. Indicate that the procedures and methods for field screening referenced in CRA's response to EPA comments will be in the FSP.

Also, please revise Figure 1 to number each landfill gas probe location.

If CRA agrees with these changes, please make the attached redline/strikeout corrections in the work plan and resubmit it as a .pdf for EPA's records. It would also help if you could change the letter heading to "Final Landfill Gas Letter Work Plan" or something similar to avoid any confusion.

Also, although EPA is not requiring any changes other than those in the EPA approved Landfill Gas Letter Work Plan, EPA would like to note the following:

1. Chemical concentrations equal to a cancer risk of 10⁻⁴ should not be used as screening criteria.
2. The detection limits are high - lower detection limits may be available at another laboratory.
3. The best, most defensible way to evaluate potential risks to occupants of on-Site buildings, especially those that may be located on top of a landfill, is to conduct subslab soil gas sampling at an appropriate number of sampling locations within each structure. It is still not clear how useful one soil gas sample collected 50 or more feet (e.g., Valley Asphalt structure, building adjacent to MW-208) from an occupied structure will be.
4. The work in the Landfill Gas Letter Work Plan may not be adequate to support meeting OAC 3745-27-12 and OAC 3745-76 requirements.

I will be out of the office until Monday and hope to get you EPA's comments on the FSP then. If you have any questions or would like to discuss the Site further, please feel free to contact me via email or at 312-886-1843.

Thanks, Karen.



EPA-Approved Landfill Gas (Revision 2).doc



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June 13, 2008

Reference No. 038443

Karen Cibulskis
Remedial Project Manager
United States Environmental Protection Agency
Region V
77 West Jackson Boulevard
Mail Code SR-6J
Chicago, IL 60604

Dear Karen:

Re: Landfill Gas/Soil Vapor Investigation Letter Work Plan
South Dayton Dump and Landfill Site, Moraine, Ohio (Site)

This Letter Work Plan presents the South Dayton Dump and Landfill Potentially Responsible Party Group's (PRP Group's) Work Plan for a landfill gas (LFG) and soil vapor investigation at the Site. A Site plan with proposed LFG/soil vapor sampling probe locations is provided on Figure 1. This work will help address data gaps and provide information to aid in the completion of a Feasibility Study (FS). All work will be performed in accordance with the United States Environmental Protection Agency (USEPA) -approved Field Sampling Plan (FSP), Quality Assurance Project Plan (QAPP), and Site-Specific Health and Safety Plan (HASP).

The PRP Group has prepared this Letter Work Plan based on the discussions between the PRP Group and USEPA in February 2008. The Letter Work Plan incorporates comments received from USEPA on May 7 and 28, 2008.

The objectives of this Letter Work Plan are to:

1. assess the presence of LFG and soil vapor at locations within the Site (pressure, methane, lower explosive limit (LEL), carbon dioxide and oxygen; and other chemicals at the detection limits listed in Table 1);
2. obtain current data in locations where historic information indicated potential landfill gas generation concerns;
3. develop information to assist in calculating future landfill gas generation rates for the FS. Four of the 20 gas probes are located within the limits of the Preliminary Direct Contact Risk - Presumptive Remedy Area (DC-PRA) and will provide information with respect to LFG/soil vapor generation within known municipal waste landfill areas at these locations. The scope and location of the gas probes has also taken the closest receptors into consideration. A total of 14 gas probe locations are proposed for



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installation along Dryden Road. Twelve of the sixteen gas probes are located on commercial properties within 50 feet of occupied structures on Dryden Road. These gas probes will provide data near occupied structures with respect to the risk to occupants of adjacent buildings from LFG and soil vapor migration from the Site; and

4. develop information to assist in evaluating the need for and type of landfill gas control at the Site for the FS.

LANDFILL GAS/SOIL VAPOR INVESTIGATION

Gas probes will be installed to evaluate LFG and soil vapor concentrations at locations within the Site, including the properties along Dryden Road. Twenty gas probes will be installed. Gas probe locations are presented on Figure 1. The procedures for installation of the gas probes are described below.

Five gas probes will be installed in the central portion of the Site (four within the DC-PRA) to evaluate the presence of methane and non-methane organic compounds (NMOC) in the zone where the LFG/soil vapors will most readily migrate at these locations. Three gas probes will be installed in the vicinity of the former underground storage tank removals and the Valley Asphalt drum removal area to assess landfill gas and soil vapor quality in the zone where the LFG/soil vapors will most readily migrate at these locations.

Fourteen of the gas probes are proposed to be installed on or adjacent to the Site boundary and in the vicinity of the commercial properties and structures along Dryden Road and west of East River Road to assess LFG and soil vapor quality in the zone where the LFG/soil vapors will most readily migrate and, if present, would pose the greatest risk to any occupants of the buildings at these locations.

GAS PROBE INSTALLATION

Gas probes will be installed using a 50-mm (2-inch) diameter Geoprobe dual-tube direct push technique to minimize formation disturbance. The borehole for each gas probe will be advanced to a target depth in the unsaturated zone (a maximum of 20 feet below ground surface or 2 feet above the water table, whichever occurs first).

Soil and fill materials encountered will be logged. The soil log information recorded will include a visual description of the types of material (i.e., undisturbed native soil, spoils from quarry operations, domestic refuse, industrial refuse, metallic debris, ash, fly ash, construction and demolition debris, foundry sand, asphalt, slag, or other appropriate description) and, if



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possible, a Unified Soil Classification System (USCS) description. Native soils will be logged using the USCS by CRA's staff. A photograph of each core sample collected will be taken and a photographic log will be documented in the field notes. Should groundwater be encountered in any borehole, the tube will be pulled up a minimum of 2 feet above the water table. The void that is formed when the tube is pulled will be filled using No. 3 silica sand. The groundwater elevation of the nearest monitoring well will be used to determine the targeted depth of the borehole for the gas probes.

LFG and soil vapor will not preferentially migrate through discrete intervals of fill material at the Site unless impermeable layers are present between the discrete intervals of fill material. Based on the available Site geological data, intervals that are impermeable to LFG/soil vapor have not been identified. Further, LFG and soil vapor migration to ambient air or into a building will occur from the shallow soil horizon. Accordingly, in areas where landfilled materials are not present, the screened interval of the gas probes will be installed in soil strata with a notably higher permeability than the surrounding geologic strata. The gas probe screen will be set as shallow as possible within the higher permeability stratum. In order to prevent short circuiting of ambient air into the gas probe and, consequently, dilution of LFG/soil vapor samples, the top of the gas probe screen will be installed a minimum of three feet below ground surface. The final depth of the gas probe screen will be dependent on the conditions observed at each location and will be determined in the field. The proposed soil vapor sampling program has been established to collect and analyze LFG/soil vapor samples that are representative of soil vapor quality in the most permeable zone in the vicinity of the probe, which is the zone where LFG and NMOC will migrate. If these soil borings encounter multiple, discrete permeable zones that appear to have vastly different LFG/soil vapor impacts based on field screening, then CRA will either consult with USEPA's field representatives and install more than one gas probe at that location or identify that area as potentially requiring additional characterization in later stages of investigation or remediation at the Site. The methods and procedures to be used for field screening will be provided in the FSP.

The average depth of the unsaturated zone across the Site is approximately 20 feet bgs; therefore, a target maximum depth of 20 feet bgs is based on the need to place the gas probes in the unsaturated zone near the surface where LFG/soil vapor, if present, will diffuse and migrate.

The purpose of this investigation is to assess the migration potential and generation rate(s) of methane and NMOC in the soil gas at sampled locations. If gas probes are installed in the 2-foot interval above the water table, the gas probes will periodically be saturated and will not generate meaningful data. The proposed gas probe locations will also address LFG/soil vapor concentrations at locations near potential receptors.



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The screened interval will be selected based on field observations that will identify the presence of landfill materials or, in the absence of such materials, a comparatively permeable region in the unsaturated zone that would be expected to transmit LFG and/or soil vapor. The selection of the most permeable zone will be based on soil descriptions and characterizations using the Unified Soil Classification System (USCS). The gas probe sampling and screened interval selection details are summarized in the Field Sampling Plan (FSP), CRA May 2008. Where landfilled materials are present, the screen will be placed at a depth immediately above the landfilled materials. If the landfilled material extends to within three feet of the surface and it is, therefore, not possible to set the screen above the landfilled material, the screen will be placed within the landfilled material, with the screened interval set as close to the top of the landfilled materials as possible but deep enough to minimize the breakthrough of ambient air from the surface (i.e., 3 to 5 feet below ground surface).

The gas probes will be completed using 13-mm (0.5-inch) diameter schedule 40 PVC continuous piping (i.e., no joints) with a screened interval length of 0.3 meters (1 foot). The void space between the screened interval and formation will be filled with No. 3 silica sand (i.e., sand pack) to approximately 0.2 meters (8 inches) above the top of the screened interval. One foot of dry granular bentonite will be placed on top of the sand pack and then hydrated bentonite will be placed to just below ground surface. The sand pack and bentonite seal will be placed as the Geoprobe is withdrawn to ensure that the formation does not collapse around the screened interval or riser. A lockable surface casing will be set in concrete at the ground surface around each gas probe. The gas probe completion details are summarized in the FSP. The gas probe stratigraphic and instrumentation logs are presented in the FSP.

Soil samples will be collected from the surface and subsurface during the gas probe installation for the analysis of soil physical properties (i.e., grain size analyses, fraction of organic carbon content, plasticity index, porosity, permeability, and Atterburg limits). The procedures for collecting soil samples are presented in the FSP.

LANDFILL GAS/SOIL VAPOR SAMPLING

CRA will complete two rounds of sampling. The sampling will consist of:

- i) measurement of gas pressure;
- ii) screening for methane (v/v), LEL, and oxygen (v/v); and
- iii) collection of Summa™ canister samples for VOC analysis.

The initial LFG/soil vapor sampling will be conducted one week following the installation of gas probes. One week is considered to be more than sufficient time for any formation



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disturbances created by drilling activities to dissipate and for equilibrium conditions to be reestablished in the unsaturated zone. As a result, the soil vapor samples are considered representative of conditions in the sampled intervals at the time the samples are collected. The three sampling elements are described below.

Soil gas sampling will not be performed during or within 48 hours of a significant rainfall event (e.g. 0.5 inches) or on-site watering [after Cal EPA (2003)].

i) Measurement of Gas Pressure

A pressure gauge will be attached to the hose barb on the LFG probe to measure the static gas pressure. The pressure gauge will be sufficiently sensitive to record gas pressure to 0.1 pounds per square inch (psig). The highest value obtained during gas pressure readings will be recorded. The ambient barometric pressure will be recorded at each gas probe when soil gas pressure readings are being taken. The ambient barometric trends will also be noted (i.e., rising, falling, steady).

Two rounds of gas pressure measurements will be collected, separated by at least one month.

ii) Screen for Methane, LEL, Carbon Dioxide, and Oxygen

A Multimeter will be used to draw a sample from each probe to measure and record the methane, LEL, carbon dioxide, and oxygen readings. The highest values obtained during sampling will be recorded. The ambient and soil gas temperatures will be recorded at each gas probe when soil gas readings are being taken. The ambient barometric trends also will be noted (i.e., rising, falling, or steady).

Two rounds of this sampling will be completed, separated by at least one month.

The details regarding the calibration and maintenance frequency and procedures, instrument start up procedures, and recording of data for instruments used during the installation and sampling of the gas probes will be provided in the FSP. These instruments include PIDs, Multimeters, barometers, and thermometers. The FSP will specify gas probe purging rates and procedures. A copy of the supplier instrument calibration will be available for review in the field. All field calibration procedures and readings will be documented in the field logbook.

iii) Summa™ Canisters

One round of soil vapor samples will be collected during the first round of methane measurements using 6-liter capacity Summa™ canisters fitted with a laboratory calibrated



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critical orifice flow regulation device sized to allow the collection of the soil vapor sample over a 1-hour sample collection time. The 1-hour sample collection time for a 6-liter capacity Summa™ canister corresponds to a maximum soil vapor sample collection flow rate of approximately ~~200~~ 100 milliliters per minute (mL/min). This sample collection flow rate corresponds to the lower end of the maximum flow rate recommended in the soil vapor sampling protocol recently developed by the California Environmental Protection Agency (CalEPA) (CalEPA, 2003). A maximum flow rate of ~~200~~ 100 mL/min is recommended to limit VOC stripping from soil, and prevent the short-circuiting of ambient air from ground surface that would dilute the soil vapor sample. The low flow rate of ~~200~~ 100 mL/min will increase the likelihood that a sample representative of in situ conditions is obtained. Prior to sample collection, gas probe purging will be conducted at a maximum flow rate of ~~200~~ 100 mL/min. Three gas probe volumes (calculated based on casing and sand pack volume) will be purged to remove potentially stagnant air from the internal volume of the gas probe. The FSP provides the soil gas purging and sampling procedures including the calculation of purge volume, maximum purge volume and maximum purging rates. Once the flow rate is set for a canister, the time it will take to fill up the canister will be calculated and the sampler will retrieve the canister and turn off the flow at the calculated time to prevent the valve from being open after the canister is filled.

The Summa™ canister samples will be analyzed for VOCs using USEPA method TO-15. The VOCs included in USEPA method TO-15 (with the addition of naphthalene) and the best method detection limits that the contract laboratory can achieve are listed in Table 1. The laboratory's ability to achieve the best possible detection limits will be highly dependent on the presence of matrix interferences.

Quality assurance / quality control (QA/QC) measures to be implemented during the soil vapor sampling event include maintaining a minimum negative pressure in the Summa™ canisters following sample collection, collection of one field duplicate sample, collection of an ambient air sample, and the analysis of a trip blank Summa™ canister. Further details regarding the gas probe sampling protocol and the applied QA/QC measures are presented in the FSP.

SCHEDULE

The LFG and soil vapor investigation will begin within four weeks of USEPA approval of this Letter Work Plan, or the relevant sections of the Field Sampling Plan and Quality Assurance Project Plan, or USEPA's review of the Health and Safety Plan, whichever occurs later and following completion of clearing and grubbing activities and, if scheduling permits, test pitting and test trenching activities. The LFG and soil vapor investigation will be completed over a two-week period. The second LFG sampling event (gas pressure, methane, LEL, and oxygen)



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will occur within six weeks of the first sampling event. The PRP Group will provide the USEPA with verbal notification at least 15 days in advance of the initiation of this activity.

All work will be performed in accordance with the FSP, QAPP, and HASP, pending USEPA's approval of the relevant sections of these documents.

REPORTING

The results of the LFG and soil vapor investigation and analytical results will be summarized and presented in a technical memorandum. The memorandum will include a description of the fieldwork completed, any deviations from the proposed work, and the rationale behind the change, and photographs taken during the investigation. Figures detailing the actual installations, analytical summary tables, iso-concentration maps, and analytical data reports will also be included in the technical memorandum. The technical memorandum will be provided to the USEPA within one month of the completion of the proposed work. The data will be used in the FS and to assist in identifying potential areas where further investigation or assessment may be appropriate.

Should you have any questions on the above, please do not hesitate to contact us.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

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